Abstract of the Disclosure

A method recovers a 3D model of non-rigid 3D shape and motion of an object directly from an input video of the object by first identifying a set of features on the object in a reference image of the input video. Correspondences are then determined between the set of features in the reference image and corresponding features in each other image of the input video, These correspondences are factored by cascaded singular value decompositions into a motion matrix and a shape matrix. The 3D model can then be extracted from the factored motion matrix and shape matrix. The 3D model includes a linear basis for deformable shape of the object in the input video, and for each image a 3D rotations matrix, deformation coefficients, and translation vectors. A novel video can now be generated from the input video by manipulating the 3D model.